

# Health Consultation

US EPA RECORDS CENTER REGION 5



557240

## **Pig's Eye Landfill**

CERCLIS # MND980609085

City of St. Paul, Ramsey County, Minnesota

February 20, 1997

Prepared by:

The Minnesota Department of Health  
Under Cooperative Agreement with the  
Agency for Toxic Substances and Disease Registry

## **FOREWORD**

This document summarizes potential public health concerns at the Pig's Eye Landfill located in Ramsey County in Minnesota. It is based on a formal site evaluation prepared by the Minnesota Department of Health (MDH). A number of steps are necessary to do such an evaluation:

- **Evaluating exposure:** MDH scientists begin by reviewing available information about environmental conditions at the site. The first task is to find out how much contamination is present, where it's found on the site, and how people might be exposed to it. Usually, MDH does not collect its own environmental sampling data. We rely on information provided by the Minnesota Pollution Control Agency (MPCA), U.S. Environmental Protection Agency (EPA), and other government agencies, businesses, and the general public.
- **Evaluating health effects:** If there is evidence that people are being exposed—or could be exposed—to hazardous substances, MDH scientists will take steps to determine whether that exposure could be harmful to human health. The report focuses on public health—the health impact on the community as a whole—and is based on existing scientific information.
- **Developing recommendations:** In the evaluation report, MDH outlines its conclusions regarding any potential health threat posed by a site, and offers recommendations for reducing or eliminating human exposure to contaminants. The role of MDH in dealing with individual sites is primarily advisory. For that reason, the evaluation report will typically recommend actions to be taken by other agencies—including EPA and MPCA. However, if there is an immediate health threat, MDH will issue a public health advisory warning people of the danger, and will work to resolve the problem.
- **Soliciting community input:** The evaluation process is interactive. MDH starts by soliciting and evaluating information from various government agencies, the organizations responsible for cleaning up the site, and the community surrounding the site. Any conclusions about the site are shared with the groups and organizations that provided the information. Once an evaluation report has been prepared, MDH seeks feedback from the public. *If you have questions or comments about this report, we encourage you to contact us.*

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## **BACKGROUND AND STATEMENT OF ISSUES**

### **Introduction**

The Minnesota Department of Health (MDH) prepared this Health Consultation to identify and evaluate any potential human health hazards from the Pig's Eye Landfill and to make recommendations to protect public health. The site is listed on the U.S. Environmental Protection Agency's (EPA) Comprehensive Response, Compensation, and Liability Information System (CERCLIS) and is a Minnesota Superfund site being addressed by the Minnesota Pollution Control Agency (MPCA). Although called a landfill, the site did not operate according to MPCA rules for a sanitary landfill -- rules which were not yet in place while the site was used. Therefore, the site is more accurately described as a dump where refuse of various types were disposed of with minimal control or cover.

This Health Consultation discusses current site conditions and data collected since the completion of a Health Consultation for the site by MDH in December 1993 (MDH 1993). For more background and discussion of past data collected from the site readers should review the December 1993 Health Consultation. This report was prepared after discussions with residents near the site and staff from the City of St. Paul, Ramsey County, CP Rail, the Minnesota Department of Natural Resources (DNR), the MPCA, and the Metropolitan Council. In addition, MPCA and MDH site files were reviewed and a site visit conducted on November 14, 1996.

### **Site Description and History**

The former Pigs Eye Landfill is located within the City of St. Paul, Ramsey County, roughly three miles southeast of downtown St. Paul on the east side of the Mississippi River (Figure 1). The site is bordered by a railroad yard to the north and east, by the main Twin Cities Municipal Waste-Water Treatment Facility and Pig's Eye Lake to the south, and by Pig's Eye Lake Road, to the west. The dump is a few hundred feet east of the Mississippi River. Approximately a half mile north the dump is another old dump, the Fish Hatchery Dump. Battle Creek flows through the site into Pig's Eye Lake, which subsequently flows into the Mississippi downstream of the site (Figure 2). The exact entry point of Battle Creek into the lake is unidentifiable as it winds through a marsh area at the northern edge of the lake.

The dump was operated by the City of St. Paul from the mid-1950s to 1972 in an area occupied by small lakes and wetlands prior to disposal of mixed municipal, commercial and industrial waste from the St. Paul area. Estimates of waste deposited at the site range from 8 to 27 million cubic yards and the fill area is approximately 300 acres. From 1977 to 1985 approximately 236,000 cubic yards of incinerated sludge ash was placed on 31 acres of the site east of Battle Creek. Six inches of soil cover was reportedly placed over the ash. The dump was never properly closed and currently has an inadequate cover. A battery casing disposal area was identified at a small inlet along the lakeshore. No liner or leachate collection system exist below the fill material.

Subsurface fires have burned portions of the dump including over a two month period in 1988 (MDH 1993).

The MDH Health Consultation identified three potential pathways for human contact with site contaminants: Direct contact with site contaminants, potable use of contaminated groundwater, and consumption of wildlife that may have taken up contaminants. The report concluded from available data that possible health risks were most likely limited to any activities that might involve frequent and regular contact with contaminated media. More specific conclusions included : 1) Groundwater contaminants would likely impact Pig's Eye Lake and the Mississippi River and the extent of that impact was unknown, 2) the extent of chemical contamination on the dump surface was unknown but the ash deposits appeared to be covered with vegetation to prevent direct contact, 3) fire potential at the site was determined to be a safety concern due to the possibility of combustible waste and landfill gas, 4) off-site gas migration had not been explored and 5) past flooding may have mobilized site contaminants and accelerated their movement off-site.

The Health Consultation recommended: 1) Additional information on hazardous material allegedly dumped at the site be collected, 2) access to the dump be controlled to prevent unauthorized digging, 3) appropriate monitoring should be conducted during sub-surface drilling to ensure explosive conditions are identified if encountered, 4) the extent of groundwater contaminated by the dump should be estimated from available data, 5) the impact of dump related contaminants on nearby surface water should be assessed and 6) the impact upon area wildlife should be determined as this is related to human consumption.

### **Recent Environmental Investigations**

Since the completion of the Health Consultation in 1993, a Limited Remedial Investigation was completed for the MPCA (PRC 1994). Geoprobes were conducted and analysis of soil gas and groundwater completed. Twelve additional monitoring wells were completed allowing further analysis of groundwater. Sediment and surface water were sampled and analyzed. The report concluded that leachate from the dump is discharging to the Battle Creek and Pigs Eye Lake. Contaminants were detected in both an upper unconfined geologic unit which is present where fill material meets an organic silt and peat unit, and a lower sand unit below the organic silt and peat. Recent data is discussed by media below.

### **Surface Water**

Surface water samples were collected in June 1994 from five locations: The pond, the creek, the ditch on the northeast side of the dump, the lake and a lake recess along the dump shoreline (Figure 2) (PRC 1994). Samples were analyzed for volatile organic chemicals (VOCs), semi-volatile organic chemicals (SVOCs), pesticides, polychlorinated biphenyls (PCBs) and metals. No PCBs were detected in any samples. Metals were generally detected at higher maximum concentrations than those reported from earlier surface water studies of the site (MDH 1993). Metals, SVOCs and VOCs were detected above health based U.S. EPA Ambient Water Quality

Criteria (AWQC) for drinking and fish consumption (Table 1). The AWQC is an estimate of the ambient surface water concentration that will not result in adverse health effects in humans (USEPA 1996). Comparison to the AWQC was done as an indicator that the surface water pathway should be evaluated further.

## **Groundwater**

### Monitoring wells

In 1994, forty groundwater samples were collected from shallow groundwater with geoprobes (PRC 1994). Partially based on these results, 12 additional monitoring wells were installed across the site making a total of fourteen on-site monitoring wells (MW-3 is located off the landfill) (Figure 2). In August 1994 all on-site monitoring wells were analyzed for VOCs, SVOCs, pesticides and metals. Several contaminants were detected in monitoring wells above MDH groundwater drinking standards otherwise referred to as Health Risk Values (HRLs) (Table 2). Aldrin was detected at 0.069 µg/L in MW-7 and was the only pesticide detected. Aldrin has no established HRL.

The monitoring well samples tend to agree with the geoprobe samples from shallow groundwater. Three additional contaminants were however detected above MDH HRLs in geoprobe samples: 1,1-dichloroethylene, 1,4-dichlorobenzene, bis(chloroethyl)ether, and p,p'-dichlorodiphenyl dichloroethane (DDD).

### Private wells

In January 1989, a residential well was sampled as a background well and analyzed for VOCs and metals (Figure 1). Di-n-butylphthalate was detected and estimated at 1.94 µg/L. In addition an unknown heterocyclic amine was tentatively identified at 10 µg/L. Manganese was detected above its MDH HRL of 100 µg/L in both the sample (1060 µg/L) and in the duplicate (1050 µg/L).

In May 1989 MDH sampled two residential wells near the dump as part of a program to ensure residential wells near dumps are not impacted by dump contaminants (MDH 1989 and 1992). Both wells are upgradient of the site since appropriate down gradient wells could not be found (Figure 1). Samples were analyzed for VOCs, and indicator parameters (pH, sulphate, chloride, iron, nitrate and specific conductivity). No VOCs were detected and concentrations of the indicator parameters were within the range of background water quality. In July 1992 one new residential well was sampled and one residential well sampled in 1989 was resampled. Again no VOCs were detected and concentrations of the indicator parameters were within the range of background water quality. None of the above residential wells were sampled for manganese.

Several high capacity wells are located at the nearby sewage treatment plant. These high capacity wells pump approximately 500 million gallons per year and are screened in the Prairie du Chien

Aquifer. Contaminated surficial ground water may be drawn downward. The water is reportedly not used for drinking water (MDH 1996a).

## **Sediments**

Sediment samples were collected from five locations in May 1994, eight locations in June 1994 and two locations in September 1994 (PRC 1994, Braun 1994) (Figure 3). In May 1994 two sediments samples were taken from the lake near the shoreline, one from the lake recess, one from the creek and one from the pond near the south end of the dump. In June 1994 two samples were collected from the lake recess, one just outside of the lake recess, one where the drainage ditch on the northern border of the site enters the lake, two approximately 900 feet from the shoreline, and 2 approximately 1200 feet from the shoreline. In September 1994 two additional sediment samples were collected from the pond.

Sediments samples were analyzed for volatile organic chemicals, semi-volatile organic compounds (SVOCs), metals, pesticides and polychlorinated biphenyls (PCBs). Several pesticides and VOCs were estimated in the low parts per million (ppm) range. SVOCs, including polyaromatic hydrocarbons, were detected and estimated in the low ppm range (total SVOCs <16 ppm). PCBs were detected in the pond at a maximum concentration of 0.46 ppm. The highest metal concentrations detected were generally from the pond and the recess at the northwest end of Pig's Eye Lake.

Concentrations of SVOCs were higher in previous samples from the creek, with maximum concentrations ranging from 1.7 ppm to 6.6 ppm for individual contaminants (MDH 1993). PCBs were detected in previous lake sediments samples at a maximum concentration of 7.9 ppm (MDH 1993). No PCBs were detected in the more recent sediment samples of the lake.

Given current site use, sediments do not present a health concern.

## **Soils**

In October 1994, four test trenches were excavated to a depth of 12 feet to visually identify dump material. Fill made up of household and industrial waste was uncovered. Waste included tires, paint cans, spray cans, paper products and unlabeled crushed drums. Soil samples were taken from trenches T-2 and T-3 at a depth of 10 to 12 feet (Figure 3). VOCs, SVOCs and PCBs were detected in the part per billion (ppb) range and below MPCA draft Soil Reference Values (SRVs). T-3, located on ash material, generally had the higher concentrations of contaminants. Several metals were detected above MPCA draft SRVs (Table 4) (MPCA 1996a).

SRVs were established as a working draft in April 1996. They are used to determine acceptable concentrations of contaminants for unrestricted land use by both adults and children. The average soil contaminant concentration for a given exposure area is not to exceed its SRV. SRVs consider exposure pathways for incidental soil/dust ingestion, dermal contact and inhalation of vapors and

suspended particulates. At a site with multiple chemicals present, the cumulative risk must be evaluated for carcinogens or chemicals with similar toxicological target endpoints, if SRVs are used to determine safe cleanup levels. Cumulative risk for multiple soil contaminants has not been evaluated in this document. SRVs are used in this documents for comparison with detected concentrations to identify those contaminants which may represent a health concern, not to establish clean-up levels.

In 1994, the EPA collected more soil and sediment samples in the lake recess for analysis of total lead, total cadmium and toxicity characteristic leaching procedure (TCLP) for lead. Lead ranged from 1600 to 62,000 mg/kg, cadmium from 27 to 88 mg/kg and TCLP lead from 1.9 to 48 mg/L (MPCA 1996b). In June 1996 the MPCA selected 20 soil and sediment samples interspersed across this recess for analysis in order to define the extent and magnitude of lead contamination in the area (MPCA 1996b). Soils and sediments were collected to a depth of 6 inches. Concentrations ranged from 33 mg/kg to 59,000 mg/kg. Four of the twenty samples were detected above the MPCA draft SRV for lead of 400 mg/kg, however, these four samples were dispersed throughout lake recess.

In August 1992, surface soils samples were collected and analyzed within 8 to 11 inches of the surface in the ash disposal area (Figure 3) (MPCA 1992). Samples of grayish ash-like material were collected for analysis. All samples were analyzed for metal, SVOCs, PCBs and pesticides. Several SVOCs and PCBs were detected in the parts per billion (ppb) range and below draft MPCA SRVs. No pesticides were detected. Many metal were elevated, near or slightly under draft SRVS, but no high levels of metals were detected (Table 5).

In December 1988 and January 1989 the MPCA obtained soil grab samples at depth from 3 soil borings and 3 additional samples during the drilling of three on-site monitoring wells (Figure 3) (MPCA 1989). Samples were taken below the fill material at a depth of 12 to 17 feet and analyzed for VOCs, SVOCs, pesticides and metals. VOCs, SVOCs and pesticides were detected below MPCA draft SRVs. Antimony and manganese were detected above MPCA draft SRVs (Table 6).

In October 1992 three test borings were drilled at unidentified locations on the dump. All three borings encountered fill material (AET 1992). Soil samples were taken at various depths and analyzed for metals and VOCs. Lead and cadmium were detected above their MPCA draft SRVs (Table 7).

## **Soil Gas**

Levels of up to 1,000 ppm of organic vapors were reportedly detected in soil gas with an organic vapor analyzer (OVA) during installation of on-site monitoring wells (MDH 1993). These measurements were likely predominantly methane with smaller concentrations of VOCs. In April 1994, 105 on-site soil gas samples were collected in shallow fill material at a depth of 3 to 10 feet and analyzed for VOCs. No soil gas samples were collected in the north central portion of the

dump due to the high groundwater table where there are little unsaturated soils for gases to collect. VOCs were detected in all sampled regions of the dump. Detected VOCs with MDH draft Health Risk Values (HRVs) were compared to these HRVs to indicate ambient air concentrations at which these contaminants can become a health concern (Table 8) (MDH 1996b).

## **Wildlife**

In April 1995 the MPCA reviewed tissue data from five white-tailed deer collected from the dump (MPCA 1995). Muscle and organs were analyzed for metals, PCBs and organochlorine pesticides. Cadmium, lead, copper and zinc were detected in various tissues (DNR 1996). Cadmium was detected as high as 0.7 mg/kg in the liver and 0.9 mg/kg in muscle. Lead was detected as high as 0.45 mg/kg in liver and 3.0 mg/kg in muscle. While metals detected in the deer are not necessarily linked to exposure of dump contaminants, the study concluded that elevated cadmium and lead concentrations in edible tissues of the oldest deer sampled indicate these metals may be gradually accumulated in deer near the site. These conclusions were tentative since the sample size was small. However, if correct, levels of cadmium and lead in tissue from older deer associated with the site may be levels of health concern.

Fish from Pig's Eye Lake were sampled in 1984 for lead, cadmium and nickel and detected at maximum concentrations of 0.12, 0.05 and 0.03 mg/kg (STORET 1996). MDH currently has a fish consumption advisory for Pig's Eye Lake based on PCB concentrations in fish sampled from the lake (Appendix I).

## **Recent Site Visit**

On the afternoon of November 14, 1996 Mark Staba, MDH and Bill VanRyswyk, MPCA visited the Pig's Eye Dump and surrounding area (MDH 1996c). The weather was clear, the temperature approximately 20 degrees Fahrenheit and the surface relatively free of snow cover. The following observations were made:

- ▶ On or near the northwestern portion of the dump, soil borings were being conducted as part of an investigation by the local railroad to construct buildings for railroad personnel and a rail line on land next to and on top of dump waste. The railroad company is working with the MPCA Voluntary Investigation and Clean-up (VIC) program on this project. In addition another heated building was recently constructed near the fill to separate oil and water before sewer discharge (Figure 2).
- ▶ Access to the landfill is not restricted and can be entered from several points. A road north of the dump near the rail yard was used to access the portion of the dump east of Battle Creek (Figure 2). One or more roads leading to the portion of the dump west of Battle Creek are located off of Pig's Eye Lake Road. Signs are periodically posted along Pig's Eye Lake Road and the entrance to the railroad yard that state no trespassing is allowed.

Workers at the wood recycling facility are likely protected from dump contaminants since no waste has been reported at the surface in their work area (MDH 1996d). Waste material was however reported between their work area and Battle Creek (MDH 1996d). Soil characterization is being conducted in the area of the dump to be developed by the railroad in order to ensure future users are not exposed to dump contaminants.

Visible inspection of the dump demonstrates waste material is present at the surface in portions of the dump. Users of the dump, particularly near the creek and shoreline where significant waste material is at the surface, may be exposed to contaminants at levels of health concern. Concern about potential exposure for those near the lake recess is greatest because some of the highest levels of contaminants are regularly detected there. In addition, the area appears to be used for recreational purposes since a fire pit and bench were discovered nearby.

### **Soil Gas**

Soil gas has been detected in on-site soils. The primary health concern related to soil gas is its accumulation in enclosed structures on or near the site. The only enclosed structures currently on the site are at the wood recycling facility. Of these, only an unheated slab-on-grade utility shed is in contact with the ground. Significant soil gas intrusion into this shed or other enclosed structures at the recycling facility is unlikely. The local railroad has recently constructed a slab-on-grade oil water separator near the northwest corner of the landfill to separate oil from contaminated water before sewer discharge. Due to the usage of petroleum within the building, proper construction of an oil water separator would ensure explosive gas levels do not accumulate within it. Other new railroad buildings proposed in this area will potentially be susceptible to soil gas accumulation.

### **Wildlife**

Since the completion of the 1993 Health Consultation, the DNR has conducted a study on fishing pressure by recreational anglers in this part of the River (DNR 1993). The report, and those familiar with the site, state no recreational fishing has been observed or is likely in Battle Creek near the dump or in the northern portion of Pig's Eye Lake (MDH 1996e). This area is too shallow to be accessible by most recreational boats and bank anglers are unlikely to fish here because it is relatively inaccessible. Recreational boat anglers do use the deeper part of the lake where it is intercepted by the channel leading to the Mississippi River. This area is sometimes referred to as Hog's Lake and is a popular spot with good numbers of sauger and crappie frequently caught.

The 1993 Health Consultation stated that if certain dump contaminants (antimony, inorganic arsenic, cadmium, chromium VI, lead and thallium) were taken up by fish to any great extent they may present the most significant health risk occurring from the site. Several fish from Pig's Eye Lake have been sampled for PCBs and mercury and MDH does have fish consumption advisories for several fish due to the concentrations of PCBs detected (Appendix I). PCBs and Mercury

were detected in these fish but PCBs were detected at concentrations that require a more stringent health advisory and therefore drive the advisory. The PCBs and mercury detected in these fish may be the result of dump contaminants, other local contamination sources or long range natural deposition unrelated to the dump.

In general, PCBs and mercury tend to drive fish consumption advisories and be protective for other contaminants. The levels of cadmium, lead and nickel detected in fish from Pig's Eye Lake suggest this, since the fish advisory in place for PCBs appears to be protective for these three metals as well (ATSDR 1993 and 1995, MPCA 1995). It should, however, be noted these samples were taken many years apart, not concurrently.

The entire lake is used by commercial fisherman who net rough fish (carp, buffalo, white carp, bullhead, etc.). The fish are mainly sent to markets outside the metro area for human and animal consumption (MDH 1996d). Analysis of fish from Pig's Eye Lake indicate the fish are under FDA regulatory limits for mercury and PCBs despite many fish having MDH PCB consumption advisories. The FDA regulations for consumption of fish with PCBs are less stringent than the MDH fish consumption advisory. The FDA regulations are based on national consumption rates for all types of fish and assume the consumption of fish with high PCB concentrations are balanced with consumption of fish with low PCB concentrations. The MDH fish advisory assumes repeated consumption of fish from the same lake or river system which, in this case, results in a more stringent consumption advisory.

The 1993 Health Consultation mentioned the possibility of dump contaminants accumulating in wildlife other than fish that may be consumed by people. While deer hunting is illegal on and near the dump, there is evidence suggesting illegal hunting has probably occurred at the site. Also, deer from area road kills has been provided to various food organizations in the past. Shortly after the MPCA reviewed deer tissue data from the site, the DNR informed relevant DNR staff and other appropriate agencies to no longer distribute deer meat from the Pig's Eye Dump area for human consumption (DNR 1995). The area is currently overpopulated with deer and a special deer hunting permit may be considered in the future (MDH 1996d).

## **Groundwater**

As discussed in the 1993 Health Consultation, the movement of groundwater is strongly connected to the Mississippi River. Surficial groundwater flow is likely toward the Mississippi River and away from identified residential wells along the bluff. Area residential wells are unlikely to be impacted by the dump. Hydrogeologic data from the site and past monitoring of nearby residential wells confirms this (MDH 1989, MDH 1992, MPCA 1989). The manganese detected above the HRL in the one residential well sampled in 1989 as a background well is unlikely to be related to the dump. As part of an ongoing program to ensure residential wells continue to be unaffected by dump contaminants, MDH plans to monitor selected residential wells near the dump for VOCs, manganese, nitrates and tritium in late summer 1997.

- ▶ Vegetation, including clumps of trees exist throughout the site. Several deer were observed on-site during the visit. The ash disposal area in the southeast corner can be identified by a pronounced rise in elevation onto a plateau.
- ▶ The battery case dumping area was observed on the shoreline within the lake recess and oily sheens were noticed in the lake recess. More waste material was noticed closer to the shoreline, probably the result of water eroding the cover material. A make-shift fire pit and bench were located nearby.
- ▶ Further up the creek, near where the ash fill had been deposited, portions of the creek bank had eroded revealing significant amounts of dump waste, including possibly ash. More battery casings were also discovered near the creek in this area as well as half buried crushed 55 gallon drums.
- ▶ A functioning beaver dam was observed in the creek near the ash fill. It appeared to be holding back approximately 3 feet of water and could affect area groundwater flow. The beaver lodge was located near the dam and built into the creek bank containing fill material.
- ▶ A wood recycling facility operated by the City of St. Paul was observed on the western boundary of the dump along Pig's Eye Lake Road (Figure 2). Enclosed structures in this area include two mobile trailers and one unheated slab-on-grade utility building used to store materials.

## **DISCUSSION**

### **Current Exposure Concerns**

Available data suggest the greatest health concern at the dump is potential exposures to both physical and chemical hazards for individuals present on-site. As stated in past reports and observed in the most recent site visit, waste material, including possibly ash, are exposed along the Battle Creek and Pig's Eye Lake shoreline. Leachate was observed in the lake recess (MDH 1996c). Soil, soil gas, sediment, groundwater and surface water sampling from the site indicate on-site contamination.

Four full time workers are present year round at the wood recycling facility located on the fill. These workers spend the majority of their workday outdoors. The rail yard to the north of the dump is currently considering building structures on and next to the northern portion of the dump. Signs stating the public is prohibited from entering the dump are posted at likely entry points along Pig's Eye Lake Road. However, those familiar with the site state people use the site for recreation (walking dogs, campfires, etc.) (MDH 1996d).

Several contaminants were detected above HRLs in a single monitoring event conducted in August 1994. Groundwater conditions can change over time. Periodic monitoring of these wells for VOCs and metals commonly found in municipal dumps would indicate if groundwater conditions deteriorate or improve. If conditions were to deteriorate significantly, the potential for chemical exposures to individuals on and near the dump would have to be reevaluated.

The County Well Index (CWI) was used to identify other drinking water wells thought to be potentially impacted by the dump (MGS, 1996). None were identified but the CWI does not necessarily identify all possible drinking water wells in a given area. High capacity wells used by the nearby wastewater treatment plant were identified. The wells are approximately 300 to 400 feet deep and pump approximately 500 million gallons of water per year. These high capacity wells are not used for potable water and are unlikely to make drinking water wells within the region vulnerable to dump contaminated groundwater.

### **Surface Water**

Many contaminants were detected in surface water above human health based EPA AWQC levels for water and fish consumption. The highest levels of contaminants detected in sediments and surface water tended to be in the lake recess near the battery casing disposal area or the pond. Leachate has been observed flowing from the banks of the creek. Exposed waste, including possibly incinerated sludge ash, has been observed on the banks. This indicates contaminants in surface water can vary depending on the immediate location. While available data suggest skin contact with surface water from the site would not result in serious exposure, such exposure is nonetheless to be avoided given the possibility of concentrated levels of contaminants in localized areas due to exposed waste or leachate discharge. Fishing from the creek, ditch, or lake shoreline of the dump is to be avoided for the same reasons. Since there are no drinking water intakes located within 15 miles downstream of the site, surface water contamination from the dump is not likely to impact drinking water (MPCA 1992).

### **Future Use**

Future site development is currently unknown; however, city, county and community members have discussed integrating the site with existing area parkland (MDH 1996d). Current plans include a parking area and park trails over the site with a duck blind for physically disabled hunters on the dump as well. The chemical and physical hazards on the site would need to be fully addressed before the site is considered for use as public parkland. At a minimum soil cover over the dump would need to ensure those using the former dump would not be exposed to dump waste using reasonable exposure scenarios.

Another proposal for remediating the site involves capping the western half of the dump after waste materials from the eastern half have been redeposited onto the western half for proper grading (MDH 1996d). The eastern half of the dump would then revert back to wetlands and the

western half would be properly capped. Among other concerns, this project would need to address potential exposures to dump contaminants from the excavation of dump waste.

## CONCLUSIONS

- ▶ The former Pigs Eye Landfill is located within the City of St. Paul, Ramsey County, roughly three miles southeast of downtown St. Paul on the east side of the Mississippi River. The dump was operated by the City of St. Paul from the mid-1950s to 1972. Estimates of mixed municipal, commercial and industrial waste deposited at the site range from 8 to 27 million cubic yards and the fill area is approximately 300 acres. From 1977 to 1985 approximately 236,000 cubic yards of incinerated sludge ash was placed on 31 acres of the site east of Battle Creek. The site is listed on the U.S. EPA CERCLIS and is being addressed under the Minnesota Superfund program.
- ▶ In December 1993 MDH completed a Health Consultation for the dump. The report recommended: 1) additional information on hazardous material allegedly dumped at the site be collected, 2) access to the site be controlled to prevent unauthorized digging, 3) appropriate monitoring should be conducted during sub-surface drilling to ensure explosive conditions are identified if encountered, 4) the extent of groundwater contaminated by the site should be estimated from available data, 5) the impact of site related contaminants on surface water on and near the dump should be assessed and 6) the impact upon area wildlife should be determined as it relates to human consumption.
- ▶ Several groups were identified who may potentially be exposed to dump contaminants: Workers at the wood recycling facility, railroad workers who might use the buildings proposed for construction on or next to the dump, people consuming fish or deer meat at or near the site, those using the site for recreational purposes (walking, skiing, campfires, etc.).
- ▶ The greatest health concern at the site is potential exposures to both physical and chemical hazards for persons present on the dump itself. Waste material, including possibly ash, are exposed along the Battle Creek and Pig's Eye Lake shoreline. Soil, soil gas, sediment, groundwater and surface water data from the site indicate on-site contamination.
- ▶ Workers at the wood recycling facility are likely protected from dump contaminants since no waste has been reported at the surface in their work area (MDH 1996d). Soil characterization is being conducted in the area of the dump being developed by the railroad to determine if future railroad workers could be exposed to dump contaminants.
- ▶ Visible inspection of the dump demonstrates waste material is present at the surface in portions of the dump. This suggest users of the dump, particularly near the creek and shoreline where significant waste material is at the surface, may be exposed to

contaminants at levels of health concern. The dump may be used for recreational purposes since a fire pit and bench were discovered near the lake shoreline.

- ▶ The primary health concern related to soil gas is its accumulation inside enclosed structures on or near the site. No enclosed structures near or on top of the dump are considered likely to accumulate significant amounts of landfill gas. The proposed new railroad buildings would potentially be susceptible to soil gas accumulation.
- ▶ Recreational fishing is not likely in Battle Creek near the dump nor in the northern portion of Pig's Eye Lake. The deeper part of the lake, where it is intercepted by the channel leading to the Mississippi River, is a popular spot for recreational boat anglers. MDH has a fish consumption advisory for bluegill, carp and northern pike in Pig's Eye Lake for PCBs (Appendix I). The entire lake is used by commercial fisherman who net rough fish; however, sampling conducted on fish indicate these fish are under FDA regulatory limits for mercury and PCBs.
- ▶ Evidence suggest illegal deer hunting has probably occurred at the dump. Deer from area road kills had been provided to various food organizations in the past. An MPCA study concluded that elevated cadmium and lead concentrations in edible tissues of the oldest deer sampled indicate these metals may be gradually accumulated in deer from the dump to levels of health concern (MPCA 1995). However, the sample size was small and the conclusions are tentative. The DNR informed its staff and other agencies to no longer distribute deer meat for human consumption from the Pig's Eye Dump area (DNR 1995). The area is currently overpopulated with deer and culling may be considered in the future (MDH 1996d).
- ▶ The horizontal movement of groundwater is likely connected to the Mississippi. Nearby residential wells are unlikely to be impacted by the dump and past monitoring confirms this (MDH 1989 and 1992, MPCA 1989). Manganese above the HRL and low concentrations of VOCs were detected in the one residential well sampled in 1989 but it is unlikely these contaminants are related to the dump.
- ▶ Several contaminants were detected above HRLs during a single monitoring event conducted in August 1994. Groundwater conditions can change over time. Periodic sampling of these monitoring wells would indicate if existing groundwater conditions deteriorate or improve. If conditions were to deteriorate significantly, the potential for chemical exposures to individuals on and near the dump would have to be reevaluated.
- ▶ The large volume of water pumped by wells at the wastewater treatment plant suggest that contaminated surficial groundwater may be drawn downward. These high capacity wells are not used for potable water and do not likely make drinking water wells near the dump vulnerable to dump contaminated groundwater.

- ▶ Surface water contaminants were detected above human health based EPA AWQC levels for water and fish consumption. Available data suggest skin contact with surface water from the dump would not result in significant exposure. Exposure is nonetheless to be avoided given the possibility of concentrated levels of contaminants in localized areas due to exposed waste or leachate discharge. Fishing from the creek, ditch, or lake shoreline of the dump is to be avoided for the similar reasons. Since there are no drinking water intakes located within 15 miles downstream of the dump, contamination of surface water is not likely to impact drinking water (MPCA 1992).
- ▶ Future site development is currently unknown, however, plans for using the site as a public park are being considered. Another plan being discussed involves capping the western half of the dump after waste material from the eastern half has been redeposited on the western half for proper grading. At a minimum soil cover over the dump would need to ensure those using the former dump would not be exposed to dump waste using reasonable exposure scenarios. If dump waste are excavated, the potential for human exposure to uncovered contaminants would need to be assessed beforehand.

### **RECOMMENDATIONS**

- ▶ Restrict access to the one road leading into the portion of the dump east of Battle Creek. Gating the entrance would appear to be the easiest way of accomplishing this. Access into the portion of the dump west of Battle Creek should be restricted unless vehicles could easily bypass possible barriers.
- ▶ Resample the residential well sampled as a background well in 1989 because manganese was detected above its HRL. If manganese is still found above the HRL the residents should be informed.
- ▶ Report to the MPCA if workers at the wood recycling facility notice exposed waste material or leachate seeps in their work area.
- ▶ The MPCA VIC program should review soil characterization data for the proposed railroad development and, if necessary, appropriate measures should be taken to ensure railroad workers are not exposed to dump contaminated soil or waste.
- ▶ Implement MPCA draft Guidelines and Protocol for Monitoring for Landfill Gas at and Near Former Dumps for the proposed railroad buildings on and near the dump to ensure landfill gas does not accumulate within the proposed railroad structures (Appendix II). If significant amounts of combustible gas are detected within the proposed structures (500 ppm or greater in ambient air and/or 5,000 ppm or greater at a point source) monitoring for individual VOCs within the building or in soil near the building should be considered.

- ▶ If the DNR issues special deer hunting permits in the area, issuers of these permits should inform hunters that deer meat from older animals may contain elevated levels of cadmium and lead. Minnesota State Highway Patrol Officers should likewise attempt to inform anyone they come across who may be consuming deer meat from area road kill.
- ▶ Sample existing monitoring wells periodically for VOCs and metals commonly found in municipal dumps to determine if groundwater conditions change significantly over time.
- ▶ MDH will distribute this document to property owners of the dump and appropriate city, county and state officials. MDH will contact appropriate individuals and encourage implementation of the recommendations discussed above.
- ▶ MDH will complete a fact sheet summarizing this report and attempt to distribute it to the local community as well as other interested individuals or organizations.
- ▶ MDH will reevaluate this site when future land use has been determined in order to assess potential or real exposures to dump contaminants.

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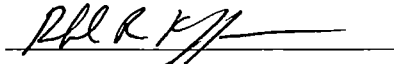
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## CERTIFICATION

This Pig's Eye Dump Site Health Consultation was prepared by the Minnesota Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.



Richard R. Kauffman, M.S.

Technical Project Officer

Superfund Site Assessment Branch (SSAB)

Division of Health Assessment and Consultation (DHAC)

ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation, and concurs with its findings.



Richard E. Gillig, M.C.P.

Chief, SPS, SSAB, DHAC, ATSDR

**Table 1: Maximum Concentrations of Contaminants Detected in Surface Water (June 1994)**

Units in µg/L

<b>Chemical Contaminant</b>	<b>Range</b>	<b>Location of highest concentration detected</b>	<b>EPA Ambient Water Quality Criteria for Human Health *</b>
Acetone	10 UJ - 22UJ	Creek	N/E
Aluminum	55.7 J -7,520	Lake Inlet	N/E
Arsenic	2.0 J - 16.7	Lake Inlet	0.022
Barium	108 J-2,300 J	Lake Inlet	1000
Benzene	BDL - 5J	Lake Inlet	6.6
Benzo(a)anthracene	BDL -1J	Lake Inlet	0.028
Benzo(b)fluoranthene	BDL - 2J	Lake Inlet	0.028
Benzo(a)pyrene	BDL - 13	Lake Inlet	0.028
Beryllium	BDL - 2.4J	Lake Inlet	0.068
Beta BHC	BDL - 0.026	Lake Inlet	N/E
bis(2-ethylhexyl)phthalate	10 UJ	Multiple Locations	N/E
2-Butanone	BDL - 10 UJ	Lake Inlet	N/E
Cadmium	BDL - 52.6	Lake Inlet	10
Carbazole	BDL -2J	Lake	N/E
Chlorobenzene	BDL - 2J	Multiple Locations	4.88
Chromium	BDL - 35.6	Lake Inlet	50 (Chromium VI)
Chrysene	BDL -2 J	Lake Inlet	0.028
Cobalt	BDL -22.0 J	Lake Inlet	N/E
Copper	BDL - 997	Lake Inlet	N/E

Cyanide	BDL - 37.0J	Ditch	200
1,4-Dichlorobenzene	BDL - 1J	Lake	400
1,2-Dichloroethane	BDL - 1 J	Creek	9.4
Di-n-butylphthalate	BDL - 10UJ	Lake	N/E
Dimethyl phthalate	BDL - 10UJ	Multiple Locations	313,000
Fluoranthene	BDL -3J	Lake Inlet	42
2-Hexanone	BDL - 10 UJ	Multiple Locations	N/E
Lead	1.2J - 36.2J	Lake Inlet	50
Manganese	61.5J - 2,710 J	Lake Inlet	100
Methylene chloride	BDL - 10 UJ	Multiple locations	1.9
Mercury	BDL - 0.16J	Lake Inlet	0.144 (Elemental)
Nickel	BDL - 256	Lake Inlet	13.4 (Soluble salts)
Phenanthrene	BDL - 2 J	Lake Inlet	0.028
Pyrene	BDL -2J	Lake Inlet	0.028
Selenium	BDL - 2.1J	Creek (near ash fill)	10
Styrene	BDL - 1J	Multiple Locations	N/E
Vanadium	BDL - 69.3	Lake Inlet	N/E
Xylenes	BDL - 3 J	Lake Inlet	N/E
Zinc	BDL - 9,710 J	Lake Inlet	N/E

J = Estimated concentration

UJ = Estimated quantitation limit

BDL = Below laboratory method detection limits

\* The incremental increased risk for carcinogens is estimated at 1 additional cancer for every 100,000 exposed individuals using the U.S. EPA's Ambient Water Quality Criteria for human health numbers.

N/E = None established

**Table 2: Groundwater Contaminants Detected above MDH HRLs in Monitoring Well (August 1994)**

**(Results in µg/L)**

<b>Contaminant</b>	<b>Range of Concentrations Detected</b>	<b>Location of highest detection</b>	<b>MDH HRL</b>
Benzene	BDL -53	MW-1	10
Antimony	BDL -49.6 J	MW-7	6
Beryllium	BDL -0.69 UJ	MW-9	0.08
Manganese	29.0 J - 3,820 J	MW-2	100
Nickel	BDL - 136	MW-15	100 (soluble Salts)
Thallium	BDL - 5.5 J	MW-15	0.6 (salts)
PCBs (aroclor 1242)	BDL - 3.9	MW-8	0.04 (PCBs)

BDL = Below laboratory method detection limits

J = Estimated concentration

UJ = Estimated quantitation limit

**Table 3: Metal and PCB Concentrations in Sediments (May and September 1994)****(Units in mg/kg)**

<b>Contaminant</b>	<b>Range</b>	<b>Location of Highest Detection</b>
Aluminum	1,600 - 22,800	Pond
Arsenic	2.7J - 14.4	Pond
Antimony *	BDL - 59.1J	Pond
Barium	30-1,040	Pond
Beryllium	0.30J -1.5 J	Inlet
Cadmium	1.0 - 77.6 J	Pond
Chromium	4.9 - 832	Pond
Cobalt	BDL- 56.8	Pond
Copper	11 - 1,430	Pond
Cyanide *	BDL - 0.72 J	Pond
Lead	16 - 861 J	Pond
Manganese	110 - 2,260	Inlet
Mercury	BDL - 0.84	Inlet
Nickel	BDL - 255	Pond
PCBs (aroclor1248 and 1254)	BDL - 0.460J	Pond
Selenium	BDL - 5.7 UJ	Pond
Silver	BDL - 45.2	Pond
Vanadium	8.8 - 59.9	Inlet
Zinc	49 - 2,140	Pond

\* Analyzed for in pond sediments only

UJ = Estimated quantitation limit

J = Estimated concentration

BDL = Below laboratory method detection limits

**Table 4: Concentrations of Contaminants Detected in Soils from Two Excavated Trenches above MPCA Draft SRVs (October 1994)**

(Units in mg/kg)

Chemical Contaminant	Concentrations Detected	Location of Highest Concentration Detected	MPCA Draft SRV
Antimony	12.3UJ and 17.0UJ	Ash fill	14
Chromium *	39.1 and 816	Ash fill	126 (Chromium VI)
Lead	81.4J and 506J	Ash fill	400

UJ = Estimated quantitation limit

J = Estimated concentration

\* No speciation was done on chromium, therefore the concentration of chromium VI is assumed to be equal to or less than the total chromium detected.

**Table 5: Concentrations and Locations of Metals Detected at or near Draft MPCA SRVs in Soil Samples from Ash Fill (August 1992)**

(Units in mg/kg)

Chemical	Range of Concentrations Detected (0-6")	MPCA Draft SRVs
Chromium	126J -1170 J	126 (Chromium VI)*
Nickel	41.4J - 316 J	520
Lead	50.5 - 346	400
Copper	126J -1280J	1300
Arsenic	2.8J - 11.3J	12
Cadmium	6.3J - 25.7J	26

J = Estimated concentration

\* No speciation was done for chromium, therefore the concentration of chromium VI is assumed to be equal to or less than the total chromium detected.

**Table 6: Contaminants Detected above MPCA Draft SRVs in Soil (December 1988/January 1989)**  
(Units in mg/kg)

<b>Chemical</b>	<b>Concentration Detected</b>	<b>Location of Concentration Detected *</b>	<b>Depth Sampled</b>	<b>MPCA Draft SRV</b>
Antimony	41	Soil A 88-89	12.5'	14
Manganese	2880	Soil A 88-89	15-17'	1100
Manganese	3270	Soil B 88-89	15-17'	1100
Manganese	1590	Soil C 88-89	17.6'	1100
Manganese	1150	Soil D 88-89	?	1100

\*Refer to Figure 3.

BDL = Below laboratory method detection limits

**Table 7: Concentrations of Soil Contaminants Detected above MPCA Draft SRVs in On-site Soil Borings (location unidentified) (October 1992)**

(Units in mg/kg)

<b>Contaminant</b>	<b>Concentrations Detected</b>	<b>Depth</b>	<b>MPCA Draft SRV</b>
Cadmium	120	6-8'	26
Lead	730	0-2'	400
Lead	630	4-6'	400

**Table 8: Range of Selected VOCs Detected in Soil Gas and MDH Draft HRVs (April 1994)****(Units = ppb)**

<b>Contaminant</b>	<b>Range of Concentration Detected</b>	<b>Approximate Location of Highest Concentrations Detected</b>	<b>Draft MDH HRVs</b>
Benzene	BDL - 4790	Northwestern border of ash fill	0.31 (chronic)
Ethyl benzene	BDL - 24,300	Western border of ash fill	2300 (acute)
Methylene Chloride	BDL - 7,180	North central border of fill	5.6 (chronic)
Methyl ethyl ketone	BDL -385	Northwestern border of ash fill	10,204 (acute)
Chloroform	BDL -125	Southwest portion of fill	100 (acute)
Toluene	BDL -19,650	Northwestern border of ash fill	104 (chronic)
Trichloroethylene	BDL - 2,680	North central portion of fill	366 (acute)
Tetrachloroethylene	BDL -439	West central border of fill	1015(acute)
Xylene	BDL -113,700	Western border of ash fill	226 (acute)

Figure 1: Pig's Eye Dump and Surrounding Area\*

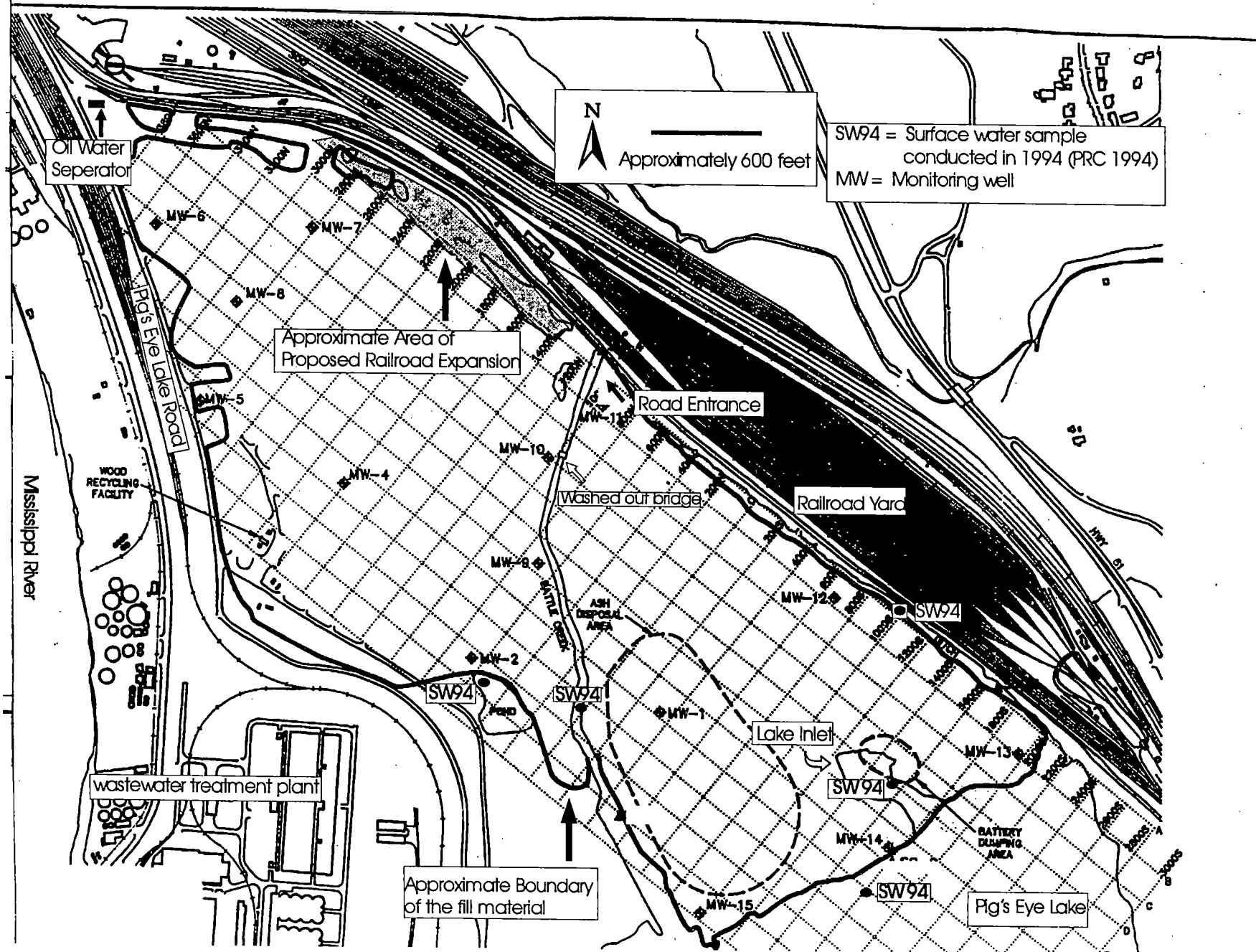


### Sampled Residential Wells

Residential Well Sampled in January 1989 = RW1/89  
 Residential Wells Sampled in May 1989 = RW5/89  
 Residential Wells Sampled in July 1992 = RW7/92

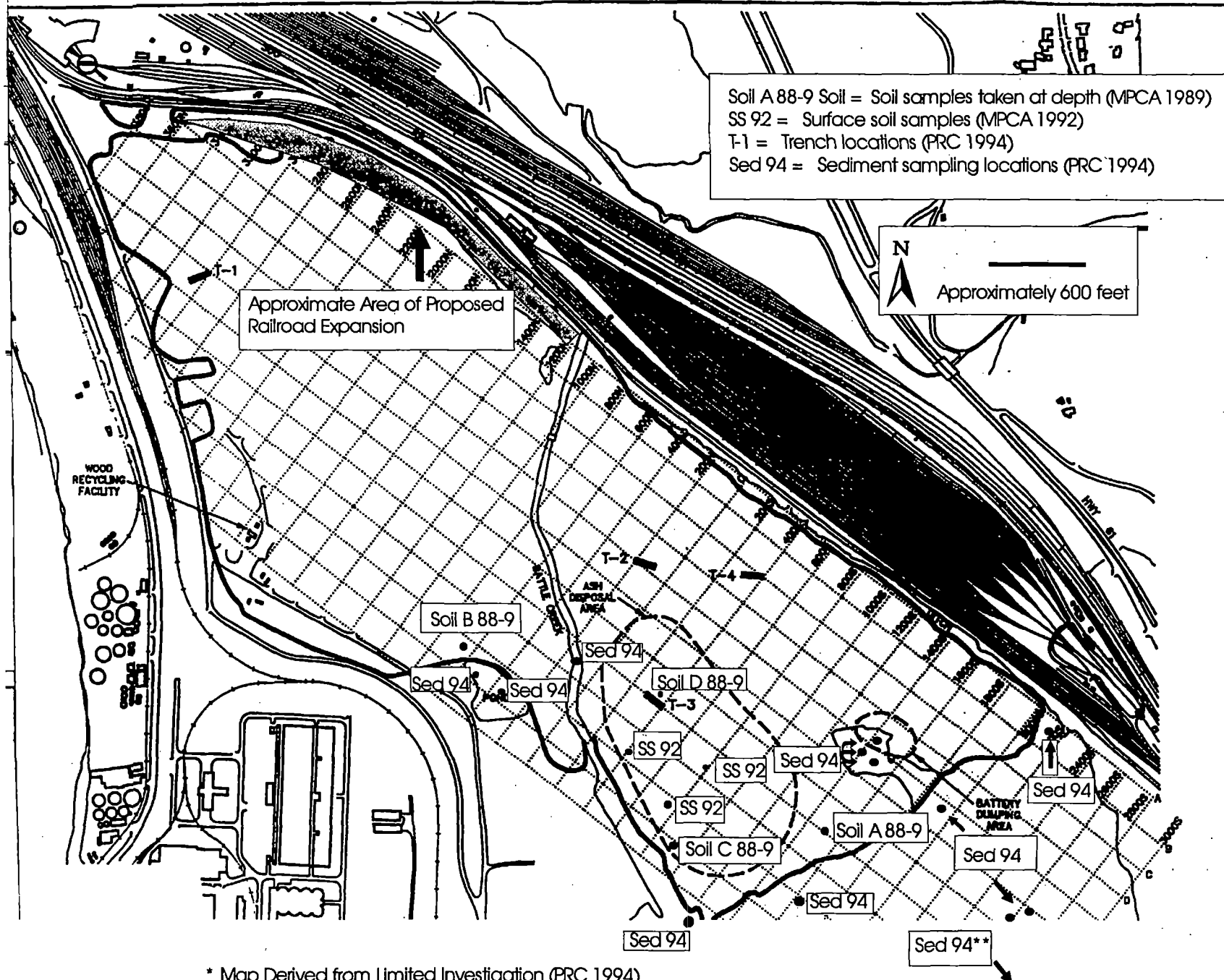
\* Mapped derived from USGS Quadrangle Map, 1967 (Photo Revised 1972)

Figure 2: Monitoring Well, Surface Water and PCB Groundwater Sampling Locations for the Limited Remedial Investigation (PRC 1994)\*



\* Map Derived from Limited Remedial Investigation (PRC 1994)

Figure 3: Soil and Sediment Sampling Locations on the Pig's Eye Dump \*











\* Map Derived from Limited Investigation (PRC 1994)

\*\* Two sediment samples were taken 900 feet further out.

## Appendix I

### Minnesota Fish Consumption Advisory for Pig's Eye Lake May 1996

PCB s				
All Persons	Unlimited	1 Meal/Week	1 Meal/Month	Do Not Eat

LOCATION	SPECIES	FISH SIZE (inches)				
		5-15	15-20	20-25	25-30	30+
<b>PIGSEYE</b> <i>(Ramsey Co., in St. Paul, also see Northstar Steel)</i>	Bluegill					
	Carp					
	Northern Pike					

## **Appendix II**

### **Minnesota Pollution Control Agency Voluntary Investigation and Cleanup Draft Guidelines for Monitoring for Landfill Gas at and Near Former Dumps**

# Minnesota Pollution Control Agency Voluntary Investigation and Cleanup

## Draft Guidelines For Monitoring For Landfill Gas At and Near Former Dumps

### 1.0 INTRODUCTION

#### 1.1 Generation and Migration of Landfill gas (LFG)

Landfill gas (LFG) generated from abandoned mixed municipal dumps and landfills consists primarily of methane, carbon dioxide and other trace constituents produced by the biodegradation of organic matter. This biodegradation is the result of the activity of microorganisms that are found naturally occurring in both wastes and soils.

Although the processes by which LFG is generated are similar at all dumps, considerable variability will exist between dumps in the amount of gas generated, the composition of the gas and the gas generation rate. Generally, methane generation is divided into four distinct phases:

##### Phase I

Upon initial placement of the waste, an aerobic phase develops characterized by rapid oxygen depletion as a result of increased microbial activity. This process can last for several months in larger dumps.

##### Phase II

At the end of Phase I, oxygen is depleted and anaerobic microbial activity is initiated, signaling the beginning of Phase II. During the anaerobic phase, leachate is produced, acidity is increased and there is a steady increase in hydrogen and carbon dioxide production.

##### Phase III

The start of Phase III is initiated by the production of methane gas. This is an anaerobic phase characterized by an accelerated increase in methane production with corresponding decreases in the levels of carbon dioxide, hydrogen, nitrogen, and acidity.

##### Phase IV

The final phase is characterized by a long period of methane production and waste degradation as methanogenic microorganisms reach steady state populations and gas constituent concentrations stabilize.

Methane generation may last from several years to decades. The length of the four phases of methane generation will vary considerably for different dump settings depending upon the amount of waste present, the composition of the waste material, moisture levels, temperature, and operational practices of the former dump.

One of the most significant factors controlling waste degradation is moisture content. The mummified conditions observed at many dumps and landfills, as evidenced by the readability of old newspapers is directly related to a relative lack of moisture needed to promote degradation. Capping of a dump or landfill to reduce moisture infiltration will therefore, also reduce the rate of gas production and waste degradation. The presence of a cap also may essentially eliminate vertical LFG escape and promote lateral LFG migration.

Waste composition affects both the methane generation rate and the total amount of methane produced. Wastes containing higher biodegradable organic content, such as food waste and paper, can produce more methane than relatively inert such as concrete, bricks, plastic and glass. Typical municipal wastes products found in former dumps such as food and yard debris contain high amounts of biodegradable material that can result in high levels of methane generation.

Temperature also has an effect upon microbial activity. Generally, higher fill temperatures result in higher rates of methane production. The optimal temperature range for methane generation is between about 95 to 120°F. Methane generation can be nonexistent at temperatures below 50°F, this may be an important factor for Minnesota sites.

## 1.2 Factors Affecting LFG Emissions and Migration

LFG emission to the atmosphere can occur at a dump site via vertical migration through the surface cover of dump and/or at perimeter locations around the dump through a combination of lateral and vertical migration. LFG migrates from areas of high pressure to areas of low pressure, driven by the subsurface pressure gradients. High pressure conditions are created within the waste mass of a dump when methane gas generation is taking place. Meteorological conditions can also affect the migration of LFG. Relative decreases in barometric pressure may accentuate LFG pressure gradients in the subsurface around dump sites resulting in an increase in vertical and lateral gas migration, and a concomitant increase in the potential for vertical escape of emissions to the atmosphere. Relative increases in barometric pressure will decrease LFG gradients around dump sites, inhibiting vertical and lateral gas migration.

The migration of LFG can be expected to occur laterally and vertically along the path of least resistance through zones of higher permeability. High permeability zones can occur naturally (geologic units of silty sand, sand and/or gravel) or can be man-made (buried utility lines which were backfilled with sand and gravel). At dump sites where impermeable covers, engineered caps or asphalt surfaces have been constructed, the potential for lateral migration of LFG beyond the boundaries of the dump site is enhanced. Potentially, even high levels of rainfall may also increase lateral migration of LFG reducing the air filled porosity and permeability of the soil column, although frozen soil will likely have a more significant effect upon lateral gas migration. The formation of thick frost zones in the soil, associated with cold Minnesota winters, result in an impermeable cap over and around a dump site, enhancing the potential of lateral LFG migration during the winter months.

## 1.3 Environmental Concerns of LFG Gas

Environmental impacts of LFG, and of methane gas in particular, can be separated into three main categories: hazards, inhalation risks, and ecological impacts.

### 1.31 Hazards

The principal hazards associated with methane gas are explosion and fire. Methane has the capability of migrating both laterally and vertically through the unsaturated soil column and potentially collecting in enclosed or confined spaces where a spark can trigger an explosion or fire. Subsurface fires also have the potential to occur at landfills or dumps and will be self-sustaining as long as there is an adequate fuel source such as unburned refuse, methane and oxygen. Methane presents an explosive hazard at concentrations between 5.5 % and 15% by volume, in air. The lower and upper levels of the range of combustible gas concentration within which explosion may occur are defined for a specific combustible gas, and are known, respectively, as the Lower Explosion Limit (LEL) and the Upper Explosion Limit (UEL). The LEL for methane therefore corresponds to 5.5% methane by volume in air, which is equal to a relative concentration of 55,000 parts per million (ppm) methane.

### 1.32 Inhalation Risks

Risks associated with LFG inhalation can include both short term and long term exposure risks. Both of the two main LFG components, methane and carbon dioxide, are colorless and odorless, and have the capability to displace oxygen, which can result in conditions with the potential for asphyxiation. The accumulation of such lethal levels is especially a concern in confined spaces, such as underground utility structures and trenches, although the potential also exists for accumulation to occur within enclosed spaces and basements in buildings located at or adjacent to a dump or a landfill.

The short term effects of LFG inhalation can include headaches and irritability. Hydrogen sulfide, an odorous gas, which can be a significant component of LFG, is an irritant to the eyes and respiratory system and can also be an asphyxiant.

Long term inhalation risks are principally associated with carcinogenic non-methane organic compounds (NMOCs) that are commonly in LFG, especially near the dump. The most common carcinogenic NMOCs detected in LFG include benzene, carbon tetrachloride, 1,2-dichloroethane, methylene chloride, trichloroethene, trichloroethane and vinyl chloride.

### 1.33 Ecological Risks

It has been shown that LFG can stress or even kill plant life by displacing oxygen within the soil near the roots of plants. Crop damage has been documented at farms near landfills. Additionally, although present in much smaller concentrations than methane and carbon dioxide, the NMOCs are precursors to the formation of ozone, a gas which, in addition to having deleterious respiratory effects, also can reduce plant growth and contribute to vegetation damage.

## 2.0 LFG MONITORING AND ANALYSIS

### 2.1 Preliminary Subsurface Methane Surveys

Gas surveys are necessary at most abandoned dumps. Although dumps are usually smaller in volume than larger, permitted solid waste facilities, they may continue to generate LFG for decades after closure. Due to the potential for changes in gas concentrations that may occur seasonally with changes in moisture, ground temperature and frost conditions, LFG monitoring should be

conducted at least three to four times per year. Monitoring needs to be more frequent near buildings in areas where explosive gases have been detected.

Preliminary LFG subsurface surveys can be conducted using temporary monitoring probes or gas vents installed to allow for multiple sampling events. Gas vents generally consist of a pipe slotted from the top of shallow water table or from below the base of wastes to a few feet below the ground surface. In most cases, gas vents are constructed in accordance with the applicable Minnesota Department of Health Well Code requirements for monitoring wells.

Monitoring of gas may be conducted utilizing portable combustible gas meters or by use of laboratory analysis of gas samples. If a portable gas meter is utilized, it must be capable of quantifying the levels of methane gas. Many available, portable combustible gas monitoring instruments are also capable of testing for other gases such as oxygen, carbon dioxide and hydrogen sulfide. The oxygen concentration is an important factor in gauging the potential for fires or explosions to occur in the waste or subsurface monitoring system.

Alternatively, gas samples may be collected in the field and analyzed by a portable gas chromatograph or sent to a laboratory for analysis. LFG samples submitted for laboratory analysis should be analyzed for toxic and carcinogenic volatile organic compounds (VOCs), similar to the compounds detected in EPA Method 18.

Sampling locations need to address the full extent of the dump or the portion of the dump on the property under investigation. If LFG is known to be present at high levels within the waste area, there may be a greater need to monitor along the perimeter of the dump, or even at properties adjacent to the dump. Areas adjacent to buildings, paved areas or other structures which impede the flow of gasses need to be monitored.

It is important to record data on ambient conditions at the time that LFG data are collected. Information on ambient conditions should include temperature and barometric pressure, weather conditions and any unusual conditions noted during the monitoring process.

## 2.2 Monitoring For LFG Within Building Interiors

### 2.2.1 General Considerations

The presence of LFG and its potential to migrate to structures both on-site and adjacent to the site should be evaluated. The evaluation should consider the potential for LFG, particularly methane, to migrate and accumulate within enclosed or confined spaces of commercial, industrial and residential buildings. This evaluation is best conducted by both assessing subsurface LFG levels in the vicinity of the buildings along with actual gas monitoring within buildings of concern. A thorough subsurface gas survey near buildings may indicate if gas is migrating towards and potentially within a building. This type of survey may eliminate the need for expanding the monitoring activities to the buildings. Alternatively, if thorough subsurface investigation for the presence of methane gases can not be undertaken, or if levels of subsurface methane gas are very high on-site, an investigation for the presence of LFG within structures of concern should be conducted directly. If high soil gas levels are present at a site and potential for migration to structures on- or off-site exists, then an evaluation of the presence of LFG in these structures should be given a high priority. At sites where preferential pathways include subsurface utility lines or trenches the authorities responsible for maintaining these utilities may need to be notified.

as the interior atmosphere of manholes, and other utility confined spaces, may also need monitoring prior to entry.

Gas monitoring within buildings may form an integral part of the investigative phase, may be used as an interim measure until gas controls are installed, or may be part of a long term program to ensure gas levels are not entering buildings or reaching levels of concern within those buildings.

## 2.22 Monitoring Equipment

Currently there is a wide variety of combustible gas and gas specific monitoring equipment available featuring a broad range of precision. A summary of monitoring equipment that is used most commonly for soil gas assessments is presented in Table X.

Certain combustible gas meters may not be capable of detecting gas concentrations in the low part-per-million (ppm) range. Gas levels at these lower concentrations can be detected using sensitive combustible gas monitoring equipment, by collecting air samples for laboratory analysis or by using a combination of a portable flame ionization detector such as an organic vapor analyzer (OVA) and a photoionization detector (PID). An OVA will detect all volatile organic compounds including combustible gases such as methane, whereas a PID will not be able to detect methane. Portable filters capable of screening out methane are also available for some OVAs.

When gas monitoring is being conducted in a building where minor concentrations may be present, monitoring instruments may respond to the presence of combustible gas in the following manner: the reading on the monitor display may rise from zero ppm to a peak concentration and then drop off, perhaps back to a zero value. The highest concentration should be recorded as this indicates a maximum concentration which accumulated in ambient air or observed at a point of entry. The conditions under which the measurement was taken and meter fluctuations should be noted, however, as the degree of concern will be significantly higher if the gas concentration measured is relatively constant since a higher average air concentration will be indicated.

Continuous-read combustible gas sensors with alarms may be required at some buildings located near or on a source of LFG, particularly if methane has been detected in the buildings. These sensors should be capable of detecting combustible gas at least down to 1 % LEL for methane and alarms should be set no higher than 10 to 15% LEL.

The level and type of monitoring required will need to be evaluated on a site-specific basis. Factors include: monitoring equipment available, the degree of concern for potential explosive hazard, levels of gas detected and the proximity of structures to waste sources and other site specific conditions. The degree of concern for a given structure also may depend upon whether the LFG is detected in or near an enclosed area, whether the LFG has the potential to build up to greater levels, the type of activities in or near the area where the gas is detected, and the proximity to the source of the LFG.

## 2.23 Documentation Recommended During Monitoring

Minimum documentation during LFG monitoring should include:

- the name and organization of the personnel conducting the monitoring
- a description of the potential points of entry in the structure
- locations of possible confined or enclosed areas of the building

Acceptable monitoring frequency will vary considerably depending upon gas concentrations detected, the location of gas detections, the degree of concern and the potential for significant seasonal temperature and barometric fluctuations in the area of the site. At sites in which methane has been detected within a building or in the subsurface near a building, monitoring should be conducted quarterly.

Levels of LFG in the low ppm level within manholes or within the soil gas near or adjacent to a structure may also need to be monitored routinely in order to evaluate the potential for temporal and seasonal fluctuations within the soil gas. A bi-monthly or monthly monitoring program may be needed at some sites during seasonal periods of peak gas movement. Peak gas movement is likely to occur during the period from November through April, when a frost cap is usually present. This period may be even longer if the site is located in northern Minnesota.

Weekly gas monitoring is recommended for buildings that are located close to LFG sources, at locations where consistently high gas readings have been observed, and where high exterior methane gas is detected near the structure. Monitoring more frequently than weekly may be required where high levels of LFL are detected in the substance adjacent to the structure, within ports of gas entry within the structure or in the ambient air of the structure. Elevated ambient air methane concentrations require a greater volume of LFG present in the structure and, therefore, a greater potential explosive or asphyxiation hazard than similar methane levels detected at a port of entry. At particularly sensitive locations, the levels of gases should be monitored with greater frequency during frost conditions.

## 225 Mounting Locations

Monitoring for gases within structures should include monitoring of both ambient air and point source locations. Before monitoring is conducted within a structure, it is necessary to evaluate the potential ports for gas entry into the structure, to identify confined or enclosed spaces within the structure, and evaluate the potential for sparking or ignition of gas, particularly within enclosed locations. Common ports of entry for gas that should be monitored include electrical conduits, elevator shafts, floor sumps, cupboards beneath first-floor sinks, cracks in concrete floors, and enclosed rather floors such as sub-floor crawl spaces. Specific locations within structures identified as having LFG concerns should be monitored in at least two locations: low, near the floor or near the possible gas entry location, and high, along basement ceiling rafters or ceiling corners where gas may have risen and become trapped.

## 26 Determining Appropriate Response Actions

Tables 2 and 3 present recommended response actions based upon combustible gas measurements at a port of entry and in ambient air, respectively. The response actions presented in Table 2 and 3 are correlated to specific combustible gas concentration ranges; the higher "tier" represent greater levels of potential concern. The higher "tiers", therefore, correspond to a higher level of response actions recommended in order to ensure gas concentrations are mitigated and public health and welfare is protected. The specific response to LFG within buildings may vary from that presented in Tables 2 and 3, depending upon site conditions, funding availability, type of equipment used, training of the personnel conducting the monitoring, and degree of access to properties. However, the recommended response actions presented should be viewed as both a goal to be achieved and a framework within which site-specific responses may be developed.

As represented by a comparison of response actions between Table 2 and 3, the relative degree of concern is less if gas is detected only at a port of entry and is not detectable in ambient air. Gas levels detected at a port of entry, however, may represent a significant problem depending upon the levels detected, the potential for the gas to accumulate within an enclosed or confined space, proximity to sources of ignition, and the response time required to seal and eliminate the gas entry ports.

At any level of gas detected in a structure it is important to be able to determine if the gas is due to a utility line leakage or is LFG. If the gas is known to be LFG, all ports of entry should be identified and sealed, if possible, in order to eliminate this source. At higher gas concentrations, the Fire Department and the Indoor Air Unit of the Minnesota Department of Health should be notified. Higher gas concentrations require an increased frequency of monitoring. This may be accomplished in part by use of a continuous read combustible gas sensor with alarms; however, some degree of follow-up monitoring with a portable meter is recommended in order to verify results and to address areas beyond the reach of the sensors. Routine inspection and maintenance of the continuous-read gas sensors should also be conducted as some sensors have been known to malfunction.

Higher gas concentrations may call for installing an active positive displacement fan ventilation system in the building or in rooms where gas has been detected. Active ventilation is especially recommended if ports of entry cannot be properly identified or sealed, or if gas concentrations cannot be mitigated by using other control measures. It is important that the ventilation results in a positive pressure being directed, if possible, on the source of gas or on a potential ignition source near where gas has been detected. Positive pressure will eliminate the likelihood of additional combustible gas being pulled into the building. If active ventilation is utilized as a gas control measure the ventilation system should be designed and installed by an experienced engineer. A properly constructed ventilation system should be able to mitigate gas concentrations to at least below 1% LEL for methane and preferably lower. If the ventilation system cannot mitigate gas to this level, either the ventilation system needs to be modified, other gas control levels need to be implemented, or evacuation need to be considered.

Where higher levels of combustible gas is indicated, there is also an increased likelihood that a higher concentration of NMOCs may be present as well. Under these conditions, the gas composition should be determined by appropriate laboratory analytical methods due to the additional health risks posed by the inhalation of NMOCs.

Levels of combustible gas up at or greater than 10 to 20 % of the LEL within the ambient air may be cause for evacuation of a building if these levels cannot be mitigated immediately. Usually gas accumulates to such high levels only in confined or enclosed spaces. The federal occupational safety and health administration (OSHA) rule 29 CFR 1910.104 outlines various confined space classes and requirements for confined space entry including the requirement that confined spaces within structures displaying at or greater than 10% LEL cannot be entered. Unless these levels can therefore, be immediately mitigated by some means, persons should exit the building immediately. The decision to evacuate a building should be made in consultation with either the local fire department, the MDH Indoor Air Unit or both. Additionally, each local fire department may have their own protocol for building evacuation and for remaining a building following evacuation. At a minimum, however, a building or an enclosed space with ambient gas concentrations 10 % LEL of methane or greater should not be entered following evacuation except by a person properly trained and wearing the proper personal protective equipment and authorized by either the MPCA or the local fire department.

The tiered action steps outlined in Tables 2 and 3 are specifically designed for responding to combustible gas concentrations within buildings on or near a former dump being administered through the MPCA VIC Program. The MPCA Solid Waste Division administers response actions at permitted landfills and response actions required under their program may be different from those described in Table 2 and 3. The tiered response actions are also not intended to replace a site-specific protocol for responding to combustible gas detected within buildings near landfills or former dumps, as each site is unique and local fire departments may have existing protocols that are both more specific and more conservative than the response actions presented. However, before implementing response actions employees at sites and buildings are less conservative than those presented within Table 2 or 3, prior approval should be obtained from the MPCA VIC staff.

# TABLE 1. COMPARISON OF COMMON COMMON FIELD GAS MONITORING EQUIPMENT

Type of Equipment	Measurement	Principle of Operation	Description
Combustible Gas Detector	ppm, % LEL, % total gas	Combustible gases change resistance of a wheatstone bridge	Within 40 % 1. Cannot be used in the presence of silicones, fuming acids, leaded gasoline vapors. 2. Not accurate in low oxygen or high CO <sub>2</sub> environments 3. Relative humidity 10-90% 4. Zero shift problem in ppm range 5. Non-selective for gas
Infrared Gas Analyzer	0 to 100 % Methane, Oxygen, Carbon dioxide; also reads in % LEL	Computerized Infrared analysis	1. All weather use from 14°F to 104° F. 2. May be battery operated. 3. Some units (i.e. Landtec GEM-500) provide also monitors for O <sub>2</sub> and CO <sub>2</sub> , use an internal reference beam for self compensation, and allows electronic data transfer using a data logger.
Flame Ionization Detectors (FID)	0 to 100 ppm to 5,000 ppm total organic vapors	Vapors are burned and the resulting ionization is measured	1. Will not distinguish between VOCs and other combustible gases such as methane without use of GC mode 2. Not appropriate as a sole real time monitoring instrument for combustible gases without assumption VOCs absent. 3. When used in GC mode, there is no temperature control
Oxygen Meter	0% to 25% GAS	Atmospheric oxygen is measured on a galvanic cell	1. Corrosive environments may result in some damaged cells 2. barometric pressure influences readings 3. relative humidity range - 10 to 90%
Combination of FID and Photolionization Detector	0 to 500 ppm	PID - photolionization lamp ionizes gas and is measured	1. PID cannot detect methane; FID can detect combustible gases and other VOCs 2. The difference in the two instruments readings
Portable Gas Chromatograph	ppb, ppm	Column with FID, PID, or Electron Capture Device	1. Required for accurate ppb measurements 2. Common in-field instrumentation for sampling probes

TABLE 1. COMBUSTIBLE GAS MEASUREMENT APPROPRIATE FOR APPROPRIATE EVENTS AND MEASUREMENTS IN THE FIELD			
TIER	Combustible Gas Concentration at Port of Entry	Recommended Response Action	Remarks
1	Up to 0.2 % LEL (10 to 100 ppm)	Initiate or continue quarterly monitoring of ambient air and ports of entry with a portable meter by trained personnel. Identify sources of elevated readings; determine if gas is LFG, other VOCs or utility gas. Eliminate spark sources, seal ports of entry if LFG is confirmed. A minimum of four rounds of non-direct LFG tests, with at least one sample event during first conditions, are needed before a decrease in monitoring frequency may be requested.	
2	0.2 to 2 % LEL (-100 to 1,000 ppm)	Continue or initiate Tier 1 actions. Increase monitoring frequency to monthly. Substances and materials should be investigated near the building. Notify Fire Department and the Indoor Air Unit of the MDH.	
3	2 to 10 % LEL (-1,000 to 5,000 ppm)	Verify results the following day. Initiate or continue Tier 1-2 actions. After sealing ports of entry, confirm effectiveness by daily monitoring for at least one week, then monthly based upon monitoring results. Initially, monitoring with a portable meter should be conducted at least monthly until levels are reduced. Continuous-read combustible gas sensors with alarms may replace or augment monthly monitoring with a portable meter. Monitoring with a portable meter should continue at least quarterly. A minimum of two sensors is recommended: one high at ceiling level or along ceiling rafters, and one at floor or sub-floor level. Gas alarms should be set no higher than 10% to 15 % of the LEL. Active fan ventilation may be called for if control measures are not able to reduce gas levels to less than 1% LEL.	
4	10 to 50 % LEL (-5,000 to 25,000 ppm)	Initiate or continue control measures (sealing ports of entry, possible installation of active fan ventilation) and site investigation actions outlined for Tiers 1-3. Install a positive displacement fan ventilation system. If control measures cannot reduce levels to less than 1% LEL, the ventilation system or other controls must be modified. Alert Fire Department and MDH of potential explosive hazard!	
5	50 % LEL or greater (greater than 25,000 ppm)	Evacuation may be recommended, depending upon site conditions, the potential for explosive hazards, and ability to immediately implement successful control measures outlined in Tiers 1-4.	

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<sup>1</sup> The local Fire Department has the final authority in responding to a fire or explosive hazard. The Minnesota Department of Health (MDH) Indoor Air Unit has expertise in indoor air quality issues.

Anita Roseman  
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**Addendum to Pig's Eye Dump Health Consultation**

This addendum was prepared to complement the Public Health Consultation prepared by the Minnesota Department of Health (MDH) at the request of the U.S. EPA. Due to the short time between completion of the consultation report and its being finalized by the Agency for Toxic Substances and Disease Registry, comments provided by the Minnesota Pollution Control Agency (MPCA) project staff for the Pig's Eye Site were not included. This addendum includes additional information or clarification provided by the MPCA in a letter dated December 13, 1993. The letter is also attached for completeness.

**MDH Response to MPCA Comments as Numbered**

(to comment 1.) The total volume of ash disposed at the Site should be 236,000 cubic yards.

(to comment 2.) Staff at the Minnesota Department of Natural Resources who are also familiar with this Site indicated that most of the Site was flooded in the Summer of 1993. However, it is possible that this most recent event did not completely inundate the entire Site. The flood of 1969 is also acknowledged.

(to comment 3.) The MPCA recently learned that the earthmoving noted during the Site Visit was done by railroad staff. They have been notified of the need to inform MPCA about any such activities in the future.

(to comment 4.) The suggestion to expand sampling results to include ash and sediment samples is taken up in this addendum. The following data summarize the sampling results (maximum detections) from the MPCA's Expanded Site Inspection Report for the Site.

Three samples of ash materials were obtained at the Site. All were tested for inorganic parameters and one of them for semi-volatile compounds and pesticides/PCBs. Most of the inorganic results were biased high--denoted by a J.

ASH MATERIAL (within 8-11" of surface)

<u>Parameter</u>	<u>Maximum Detection</u>
Phenanthrene	0.5 mg/kg
Fluoranthene	0.66 mg/kg
Pyrene	0.6 mg/kg
Aroclor 1254	0.05 mg/kg
Aluminum	25000J mg/kg
Antimony	9.8J mg/kg
Arsenic	11.3J mg/kg
Barium	560J mg/kg
Beryllium	1.9J mg/kg
Cadmium	25.7J mg/kg
Chromium	1170J mg/kg
Cobalt	16.2J mg/kg
Copper	1260J mg/kg
Lead	346 mg/kg
Manganese	770J mg/kg
Mercury	0.09 mg/kg
Nickel	316J mg/kg
Selenium	0.29J mg/kg
Silver	46.2 mg/kg
Vanadium	44.1J mg/kg
Zinc	1740J mg/kg

Five samples of sediment were collected from Battle Creek on site. Two Sediment samples were collected from Pig's Eye Lake. All were tested for inorganic parameters and several others for semi-volatile compounds and pesticides/PCBs. A background creek sediment sample also contained semivolatiles (PAMS) and a pesticide Endrin. A second background creek sample contained the pesticide 4,4'-DDD. Most of the inorganic results were biased high--denoted by a J.

SEDIMENT MATERIAL (from Battle Creek or Pig's Eye Lake)

<u>Parameter</u>	<u>Maximum Detection</u>	<u>Location</u>
Phenanthrene	3.9 mg/kg	creek
Fluoranthene	6.6 mg/kg	creek
Pyrene	5.0 mg/kg	creek
Benzo(a)anthracene	2.7 mg/kg	creek
Chrysene	3.0 mg/kg	creek
bis(2-Ethylhexyl) phthalate	4.5 mg/kg	creek
Benzo(b)fluoranthene	2.6 mg/kg	creek
Benzo(k)fluoranthene	4.1 mg/kg	creek
Benzo(a)pyrene	2.2 mg/kg	creek
Indeno(1,2,3-cd)pyrene	3.1J mg/kg	creek
Benzo(g,h,i)pyrene	1.7 mg/kg	creek
Endrin	0.03 mg/kg	creek
4,4'-DDD	0.006 mg/kg	creek
alpha-Chlordane	0.007 mg/kg	creek
gamma-Chlordane	0.004 mg/kg	creek
Aroclor 1254	7.9 mg/kg	lake
Aluminum	11500J mg/kg	lake
Antimony	33.8J mg/kg	lake
Arsenic	22.9J mg/kg	creek
Barium	610J mg/kg	creek
Beryllium	3.8J mg/kg	creek
Cadmium	9.6J mg/kg	lake
Chromium	45.6J mg/kg	creek
Cobalt	6.7J mg/kg	creek
Copper	176J mg/kg	creek
Lead	100 mg/kg	lake
Manganese	796J mg/kg	lake
Mercury	0.75 mg/kg	lake
Nickel	44.6J mg/kg	creek
Selenium	0.35J mg/kg	creek
Vanadium	32.8J mg/kg	lake
Zinc	879J mg/kg	lake

Two soil samples were tested by Toxicity Characteristic Leaching Procedure (TCLP) Method 1311 in the fall of 1993. Only Barium ( $1.2 \text{ mg/L}$ ) was found at or above method detection limits. The locations of these samples is not given.

SETBACKS 7105

CONFIDENTIAL

Concentration	Element	Concentration	Element
3.6 mg/kg	Argentic	0.2 mg/kg	Mercury
3.7 mg/kg	Cadmium	0.25 mg/kg	Nickel
56 mg/kg	Chromium	0.8 mg/kg	Zinc
730 mg/kg	Lead	0.52 mg/kg	Phenanthrene
0.2 mg/kg		0.82 mg/kg	Fluoranthene
29 mg/kg		0.93 mg/kg	Pyrene
510 mg/kg		0.44 mg/kg	Benzo (a) anthracene
		0.53	Chrysene
		0.52 mg/kg	Benzo (b) fluoranthene
		0.58 mg/kg	Benzo (k) fluoranthene
		0.41 mg/kg	Benzo (a) pyrene
		1.2 mg/kg	Cadmium
		26 mg/kg	Chromium
		630 mg/kg	Lead
		12 mg/kg	Nickel
		76 mg/kg	Zinc
		0.27 mg/kg	1,2-Dichlorobenzene
		0.42 mg/kg	Phenanthrene
		4.3 mg/kg	Butylbenzyl
		1.6 mg/kg	Phthalate
		1.1 mg/kg	2-Methylnaphthalene
		16 mg/kg	Phthalate

(to comment 6.) MDH concurs that sampling evidence has shown some hazardous compounds in leachate generating areas along Little Creek. For many other portions of the site, it remains uncertain if hazardous compounds are, or could become, exposed at the surface.

Sample Interval Parameters	
6 to 8 feet	Arsenic Cadmium Chromium Lead Mercury Nickel Zinc Dithionite Phenanthrene Bis (2-Ethylhexyl) Pyrene Xylenes
10 to 12 feet	Arsenic Cadmium Chromium Lead Mercury Nickel Zinc
14 to 16 feet	Chromium Lead Mercury Nickel Zinc
Maximum Concentration	
2.8 mg/kg	
1.20 mg/kg	
38 mg/kg	
86 mg/kg	
0.09 mg/kg	
22 mg/kg	
180 mg/kg	
0.55 mg/kg	
0.41 mg/kg	
0.76 mg/kg	
2.6 mg/kg	
3.6 mg/kg	
1.0 mg/kg	
30 mg/kg	
1.70 mg/kg	
0.15 mg/kg	
50 mg/kg	
470 mg/kg	

# Minnesota Pollution Control Agency

DEC 17 1993



December 13, 1993

Mr. David Jones  
Minnesota Department of Health  
Division of Environmental Health  
925 Delaware Street Southeast  
P.O. Box 59040  
Minneapolis, Minnesota 55459-0040

RE: Pig's Eye Dump Draft Health Assessment

Dear Mr. Jones:

Staff from the Minnesota Pollution Control Agency (MPCA) has reviewed your Draft Health Assessment for Pig's Eye Landfill (site). Listed below are the comments and concerns that have been identified.

1. The amount of ash deposited at the site was approximately 236,000 cubic yards rather than the 435,000 listed in the site background.
2. In the geology and hydrology section, parts of the site were flooded this summer not the whole site. Also, the flood of 1969 covered the site.

3. In the Usage section, this was revealed after the site inspection, that the earth moving was done by 800 line railroad staff as they moved some equipment on site to remove a beaver dam.

4. The section on review of site contamination should discuss more about the expanded site investigation (ESI) sample results. Also, the results at the end should list soil/ash and sediment numbers and should specify which sampling event these came from.

5. During the summer of 1993, soil samples were collected when Metropolitan Waste Control Commission and Minnesota Transfer Railway did some work on site this past summer. Copies of these samples results are enclosed.

6. In the conclusion section under #3 it states that it is currently unknown if hazardous compounds are exposed at the site's surface. It is our assumption that there are hazardous compounds at the surface based on the sediment samples that were collected along the creek (and the lake).

DEC-22-1993 10:01 FROM MDH DIV. OF ENV. HEALTH TO 9-2969707 P.24

Mr. David Jones  
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REPORT UNIT III

517 Response Section

GROUND WATER and SOLID WASTE DIVISION

અર્થ: ક્ષમા

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